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JC781 U.S. PTO 03/23/00

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	P-3009.2
First Inventor or Application Identifier	Thomas M. D'Angelo
Title	Method Of Making Corrugated Part
Express Mail Label No.	EL345390511US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

JC542 U.S. PTO 09/533741 03/23/00

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)* *(Submit an original and a duplicate for fee processing)*
2. [X] Specification [Total Pages 13] *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [Total Sheets 3]
4. Oath or Declaration [Total Pages 4]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 16 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1 33(b).

NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

5. [ ] Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
11. [ ] Preliminary Amendment
12. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. [ ] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
14. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
15. [ ] Other: .....

16. **If a CONTINUING APPLICATION,** *check appropriate box, and supply the requisite information below and in a preliminary amendment:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____

Prior application information: Examiner _____ *Group / Art Unit:* _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Signature		Date	3/22/2000

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METHOD OF MAKING CORRUGATED PART

This invention relates to methods for corrugating parts and more particularly to methods for corrugating strut boots having planar end segments joined by an intermediate corrugated segment.

BACKGROUND OF THE INVENTION

Methods for corrugating hollow parts are known in which an extruder directs a hollow column with respect to moveable die blocks that shape the hollow column end to end with a plurality of convolutions.

Examples of such molded parts and methods are shown in United States Patent Nos. 3,843,758, 4,319,872, 4,439,130, 4,718,844 and 5,531,583. In the past such molded parts have utilized a mold part that involves formation of a plurality of convolutions end to end of the mold block such that the resultant molded part is a corrugated tube suitable for use in irrigation and other like applications.

It is also known to separately mold strut boots and the like that include planar end segments for connection to stationary and moveable members and wherein a plurality of convolutions are formed between the planar end segments for providing for relative movement between the stationary and moveable parts to which the strut boot is attached are formed by one or more molding steps.

While suitable for their intended purpose none of the aforesaid prior art methods are able to meet cost and product rate objectives suitable for meeting the cost requirements of motor vehicle manufacturers and other customers requiring high quality, and low cost parts.

SUMMARY OF THE INVENTION

According to the present invention these objectives are met by a method for continuously forming molded parts including providing an extruder; directing a hollow column of plastic material from said extruder; providing a plurality of die blocks each including planar end segments having differing geometry and joined by intermediate convoluted segments; continuously moving such die blocks for receiving and forming the hollow column with planar end segments and intermediate convoluted segments and advancing the shaped column of plastic material from the continuously moving die blocks and providing a cutter synchronized to the movement of the shaped column for separating the planar end segments to form one or more parts having planar end segments of the same or differing geometry in each part or with differing geometry from part to part.

An object of the invention is to provide a process in which such planar end segments are formed with identical geometry and wherein a continuous molded extrusion shape is passed from the moveable mold blocks having a repeating pattern A-B-C-A-B-C defined by the expression $(A\text{-}B\text{-}C)_n$.

A further object of the invention is to provide a process wherein the end segments are formed with differing geometries and wherein the continuous molded extrusion has a repeating pattern A-B-C-C'-B-A-A-B-C-C'-B-A defined by the expression $(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$.

Yet another feature of the invention is to provide extrudent material for the aforesaid process that is a thermoplastic flexible synthetic polymer such as thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers and the base is a rigid thermoplastic such as polypropylene; filled polypropylene; talc-filled polypropylene; polyethylene; high

density polyethylene; polystyrene; PVC resins; ABS resins; TPO resins; Nylon resins; Metallocene polymers or a flexible thermoplastic material such as thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of apparatus for practicing the present invention;

Figure 2 is an enlarged perspective view of a plurality of mold blocks used in the process of the present invention;

Figure 3 is an enlarged side elevational view, partially sectioned, of a part made by the process of the present invention;

Figure 4 is an enlarged side elevational view of mold blocks used in another embodiment of the process of the present invention; and

Figure 5 is an enlarged side elevational view, partially sectioned, of another embodiment of a part made by the method of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to Figure 1, an extruding machine 10 is arranged to continuously extrude and feed a tube 12 of hot plastic material to a corrugating

machine 20. The corrugating machine includes two sets of moveable mold tracks 30, 32 constructed in accordance with the present invention to be respectively driven by vertically spaced concepts 31, 33 whereby a continuously formed hollow molded extruded part 14 is directed from the blow molding machine having spaced groups or sets of convolutions 15 separated from each other by planar segments 16, 18 having the same or differing geometry and joined to one another as the hollow molded extruded part moves from the blow molding machine.

The machine 20 has known sources of compressed heated air 22 that is directed into the tube 12 as it passes through the machine 20, the air heat expands and shapes the tube 12 against the surface of the mold cavities; can be either blown or vacuum or combination of both. Such shaping molds the annular sets of convolutions 15 and planar end segments 16, 18 along the length of the tube 12 as it moves from the blow molding machine or corrugator 20.

Figure 3 represents a strut boot as one typical embodiment of an elastic shaped article according to the present invention. In the diagram, a strut boot 26. In the strut boot, 26a denotes the bellows portion 15 and 26b, 26c the connecting end portions.

The elastic shaped article according to the present invention is useful for the production of boots, ducts, hoses, tubes, other sealing members, covering members and so on which are expected to possess elasticity and oil resistance. Such articles are of the type used in motor vehicles such as automobiles and suvs (sports utility vehicles), snowmobiles, construction machines such as bulldozers, industrial machines such as robots, machine tools, hydraulic machines and pneumatic machines.

Depending on the particular use to which the elastic shaped article according to the present invention is put; the hardness of the article may be suitably selected without departing from the spirit of the invention. When the

elastic shaped article is used in automotive boots such as shock absorber boots, rack and pinion steering gear boots, suspension strut boots and constant velocity joint boots, it acquires high mechanical strengths and high elastic recovery of bellows, the properties ideal for automotive boots, by fixing the hardness of the TE above the level of 60 by the Shore A scale, the hardness of the soft PVC below the level of 87 by the Shore A scale, and the overall wall thickness ratio of the TE layer to the soft PVC layer in the range of 50:50 to 0.5:99.5. Thus, the boots neither sustains cracks under impacts exerted by flying pebbles nor suffers from separation of joined ends owing to loss of elasticity but are permitted to manifest the features of this invention.

In the embodiment of Figures 2 and 3 the corrugator 20 includes two sets of a plurality of die blocks 30a - 30j moved on conveyor tracks 31, 33 to open and close to form a continuously advancing mold. One of the sets is shown in Figure 2 with it being understood that a like set is provided that is joined and separated by the conveyors 31, 33 to form a mold surface against which the extruded tube 12 is expanded by heated air to continuously blow mold a series of strut boots 26 shown in Figure 3. The die blocks 30b - 30i combine to form repeating semi-circular die surfaces generally designated 30k. The die surfaces 30k include spaced sets of alternating ribs and valleys 30l, 30m joined by end geometry surfaces defined by cavities 30n, 30o.

As the tube of hot plastic material is extruded into the rear portion of the blow molding zone, heat compressed air 22 or other fluid under pressure is introduced into the tube to expand the same against the mold cavity 30k, and thereby mold annular corrugations of alternating ribs and valleys along the length of the tube and the surfaces at cavities 30n, 30o. Also, as is well known, the moving die blocks 30a - 30j are driven in two endless paths by suitable drive means shown schematically at 35 in Figure 1, which drive means 35 continuously moves the cooperating sets of die blocks on the conveyors 31, 33 forwardly along

the blow molding zone to deliver the molded corrugated plastic tube 14 forwardly at a predetermined speed.

An enlarged view of a portion of the corrugated tube 14 is shown in Figure 3 wherein it will be observed that the valleys and ribs of the tube 14 are respectively designated at 26d, 26e. The tube may be of lightweight construction preferably with a wall thickness of no greater than about .060 inch and may be of a nominal diameter of about .040 inches. A tube having a four-inch nominal diameter, for example, may have an internal diameter of about 2.70 inches measured at the interior of the valley 26d, and an external rib diameter of 3.25 inches. Also, by way of example, the tube may include about 12 ribs per linear foot, with each rib 26e having a width of approximately 1/2 inch, the height of each rib when measured from the annular valleys 26d being about .26 inch, and the width of the annular valleys taken between the junctures of the side walls of the adjacent ribs 26e being about .50 inch.

The embodiment shown in Figure 3 includes a mold forming the same part suitable for use in a single application; the complete die mold has two sets of end segments 30n, 30o formed on either end of two sets of ribs and valleys 30l, 30m. When the die molds are joined by being advanced continuously in the corrugator 20, they form cavities that define two parts 26. The parts 26 each have planar end connections 26b, 26c, respectively. The end connections 26b have the same planar geometry and are suited for connection to the end of one strut boot application and the ends 26c have the same planar geometry suitable for connection to the opposite end of the one same strut boot application. The tube 12 once molded to the aforesaid shape will have a continuous, molded extrusion, generally designated 14 in Figure 1, that will be directed from the corrugator 20 to a cooling tank 35 thence to a dryer 55 and to a cutter 60 that is programmable to be synchronized to the speed of the molded extrusion as it is moved by a conveyor 55a in dryer 55 and operative to cut the continuously advancing molded extrusion

14 at joints 25 formed between the end connections 26b, 26c. The separated parts 24, 26 are then segregated from the scrap 28 trimmed by the cutter at a separator 65. For purposes of definition the segment 26b can be defined as a part segment A constituting a non-convoluted geometry in the molded part 26; the convolutions 26a can be defined as a part segment B of shaped elastic material and segment 26c can be defined as a part segment C constituting a non-convoluted geometry in the molded tube 14 of the same geometry of part segment A. In such case, the continuous molded tube 28 has repeating segments A-B-C-A-B-C, etc defined by the following formula:

$$(A\text{-}B\text{-}C)_n$$

However, it is more common that the ends of a part are not identical and that the design of the tooling and the process are enhanced when common elements are adjacent to each other for example, the end segments of smaller diameter in different parts are joined and the end segments of larger diameter are joined. In such case, shown in Figure 5, end segments 42a, 44a are joined by convolutions 46. The part segment 42a can be defined as part segment A and the part segment 44a can be defined as part segment C. In this embodiment the part segment C for one part differs slightly from another part and will be referred to as C'. In such case, a continuously molded tube 48 has repeating segments A-B-C-C'-B-A-A-B-C-C'-B-A, etc defined by the following formula:

$$(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$$

As in the case of the first embodiment, this configuration is formed by a plurality of mold blocks shown in Figure 4, they combine to form a mold half 50 having a tubular planar segment 52 with a reduced diameter segment 52a. The reduced diameter segment is in communication with spaced semi-annular cavities 54 having valleys 56 and ridges 58 shaped to form one half of the convolutions 46 in the part shown in Figure 5. The mold part 50 further includes a convergent

segment 60 that is joined to a semicircular portion 62 of reduced diameter to that of the tubular planar segment 52. The semicircular diameter portion 62 is joined to a second convergent segment 64 that merges with a radially inwardly located small diameter segment 66 of the mold half 50. The small diameter segment 66 merges with a generally vertically disposed wall segment 68 that merges with a semicircular surface 70 having a diameter similar to that of the portion 62. The mold half 50 includes a outwardly divergent semi-annular surface 71 that is joined to spaced semicircular cavities 72 having valleys 74 and ridges 76 to form one half of the convolutions 46 in the part shown in Figure 5. The mold half 50 terminates at its opposite end in a semicircular surface 78. When like mold halves are joined in the corrugator 20 they define the surfaces of the part 48 shown in Figure 5.

As in the first embodiment, the process includes the steps of extruding a hollow tube of thermoplastic material; providing mold halves having surfaces with the formula $(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$; shaping a tube 12 of heat thermoplastic material against the aforesaid surfaces of the joined mold halves 50 (one shown in Figure 4); continuously feeding a molded tube 48 having ends and convolutions with the formula $(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$ from the corrugator 20; passing the molded tube 48 through a cooling tank and a dryer then cutting the molded tube 28 between the segments C-C' to form separated elastic convoluted parts of either the same or differing end connection configurations.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

What is claimed is:

1. A method for continuously forming molded parts includes providing an extruder; directing a hollow column of plastic material from said extruder; providing a plurality of die blocks defining mold halves including planar end segments having differing geometry and joined by intermediate convoluted segments; continuously moving such die blocks for receiving and forming the hollow column into a continuous shape having spaced end segments and intermediate convoluted segments and advancing the shaped column of plastic material from the continuously moving die blocks; providing a cutter; synchronizing the cutter action to the movement of the shaped column for separating the end segments to form one or more parts having planar end segments of the same or differing geometry in each part or with differing geometry from part to part.

2. The process of claim 1 wherein the mold halves are configured to have semicircular surfaces thereon defining a different end connection on opposite ends of the parts formed therein.

3. The process of claim 1 wherein the mold halves are configured to have semicircular surfaces thereon to form end segments of differing geometry from end to end and from part to part.

4. The process of claim 1 wherein each of said mold halves has a surface thereon between end segment surfaces thereon; said cutter synchronized with the continuous formation of a molded tubular member by the corrugator for removing said surface from the end segments.

5. The process of claim 1 wherein the mold halves are configured with identical geometry and wherein a continuous molded extrusion

shape is passed from the moveable mold blocks having a repeating pattern A-B-C-A-B-C defined by the expression $(A\text{-}B\text{-}C)_n$.

6. The process of claim 1 wherein the mold halves are configured with differing geometries and wherein the continuous molded extrusion has a repeating pattern A-B-C-C'-B-A-A-B-C-C'-B-A defined by the expression $(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$.

7. The process of claim 1 wherein extrudent material for the aforesaid process is a thermoplastic flexible synthetic polymer selected from the group consisting of thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers and the base is a rigid thermoplastic such as polypropylene; filled polypropylene; talc-filled polypropylene; polyethylene; high density polyethylene; polystyrene; PVC resins; ABS resins; TPO resins; Nylon resins; Metallocene polymers or a flexible thermoplastic material such as thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers.

8. The process of claim 2 wherein the mold halves are configured with identical geometry and wherein a continuous molded extrusion shape is passed from the moveable mold blocks having a repeating pattern A-B-C-A-B-C defined by the expression $(A\text{-}B\text{-}C)_n$.

9. The process of claim 2 wherein the mold halves are configured with differing geometries and wherein the continuous molded extrusion has a repeating pattern A-B-C-C'-B-A-A-B-C-C'-B-A defined by the expression $(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$.

10. The process of claim 2 wherein extrudent material for the aforesaid process is a thermoplastic flexible synthetic polymer selected from the group consisting of thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers and the base is a rigid thermoplastic such as polypropylene; filled polypropylene; talc-filled polypropylene; polyethylene; high density polyethylene; polystyrene; PVC resins; ABS resins; TPO resins; Nylon resins; Metallocene polymers or a flexible thermoplastic material such as thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers.

11. The process of claim 3 wherein the mold halves are configured with identical geometry and wherein a continuous molded extrusion shape is passed from the moveable mold blocks having a repeating pattern A-B-C-A-B-C defined by the expression $(A\text{-}B\text{-}C)_n$.

12. The process of claim 3 wherein the mold halves are configured with differing geometries and wherein the continuous molded extrusion has a repeating pattern A-B-C-C'-B-A-A-B-C-C'-B-A defined by the expression $(A\text{-}B\text{-}C\text{-}C'\text{-}B\text{-}A)_n$.

13. The process of claim 3 wherein extrudent material for the aforesaid process is a thermoplastic flexible synthetic polymer selected from the group consisting of thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers and the base is a rigid thermoplastic such as polypropylene; filled polypropylene; talc-filled polypropylene; polyethylene; high density polyethylene; polystyrene; PVC resins;

ABS resins; TPO resins; Nylon resins; Metallocene polymers or a flexible thermoplastic material such as thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers.

14. The process of claim 4 wherein the mold halves are configured with identical geometry and wherein a continuous molded extrusion shape is passed from the moveable mold blocks having a repeating pattern A-B-C-A-B-C defined by the expression $(A\text{-}B\text{-}C)_n$.

15. The process of claim 4 wherein the mold halves are configured with differing geometries and wherein the continuous molded extrusion has a repeating pattern A-B-C-C-B-A-A-B-C-C-B-A defined by the expression $(A\text{-}B\text{-}C\text{-}C\text{-}B\text{-}A)_n$.

16. The process of claim 4 wherein extrudent material for the aforesaid process is a thermoplastic flexible synthetic polymer selected from the group consisting of thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers and the base is a rigid thermoplastic such as polypropylene; filled polypropylene; talc-filled polypropylene; polyethylene; high density polyethylene; polystyrene; PVC resins; ABS resins; TPO resins; Nylon resins; Metallocene polymers or a flexible thermoplastic material such as thermoplastic vulcanizates (TPV's); thermoplastic polyolefins (TPO's); ionomer resins, such as Surlyn; flexible PVC resins; thermoplastic elastomers (TPE's); flexible polyurethane polymers.

P-3009.2 HAHN

METHOD OF MAKING CORRUGATED PART

ABSTRACT

A method for continuously forming molded parts includes providing an extruder; directing a hollow column of plastic material from said extruder; providing a plurality of die blocks each including planar end segments having differing geometry and joined by intermediate convoluted segments; continuously moving such die blocks for receiving and forming the hollow column into strut boots with planar end segments and intermediate convoluted segments and advancing the shaped column of plastic material from the continuously moving die blocks and providing a cutter synchronized to the movement of the shaped column for separating the planar end segments to form one or more parts having planar end segments of the same or differing geometry in each part or with differing geometry from part to part.

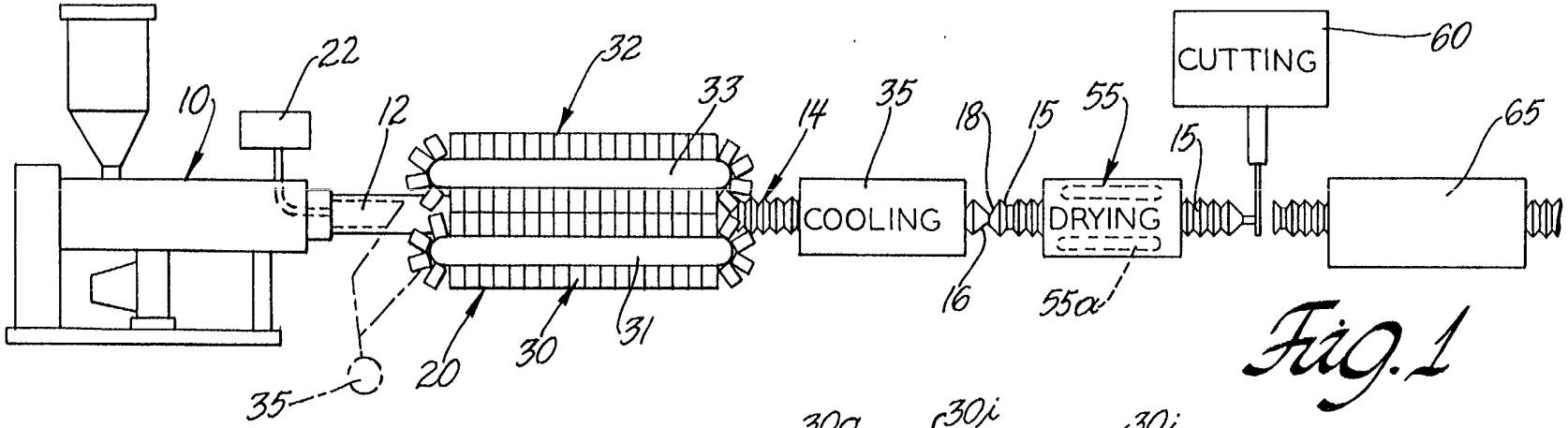

Fig. 1

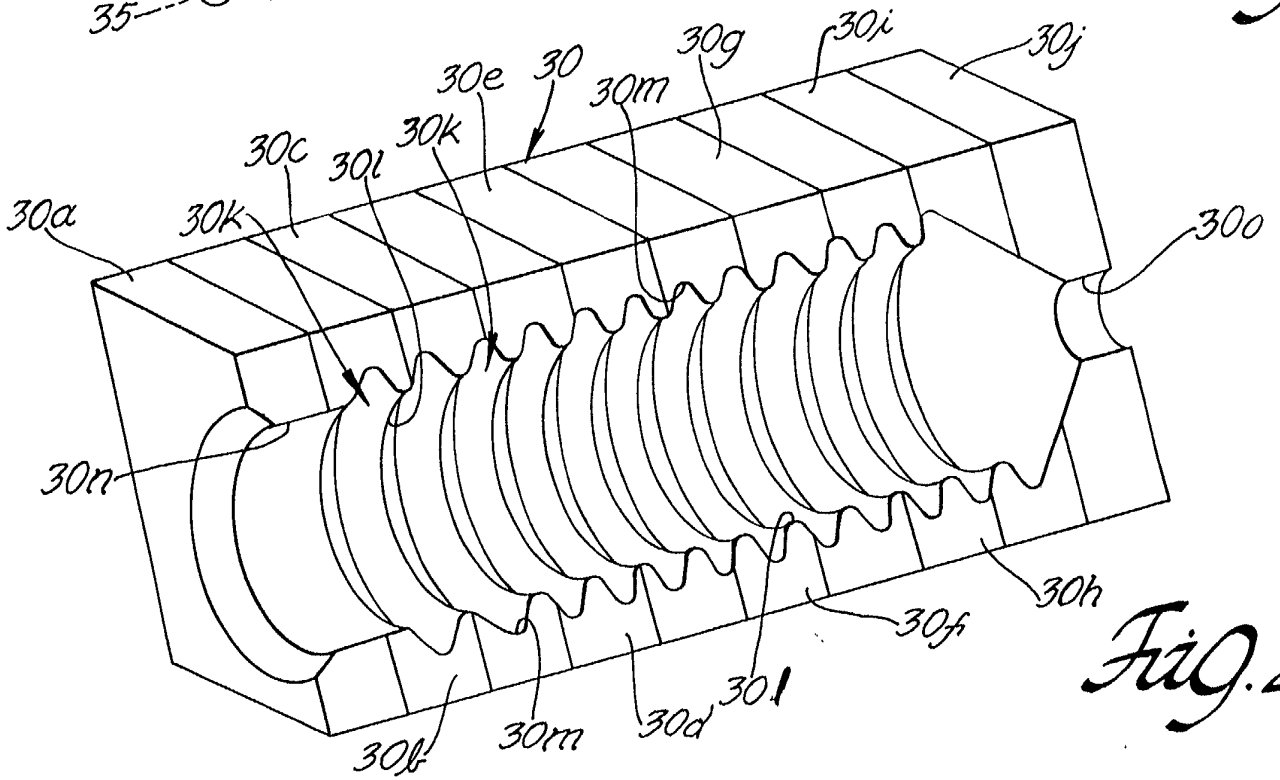

Fig. 2

US 6,033,741 A

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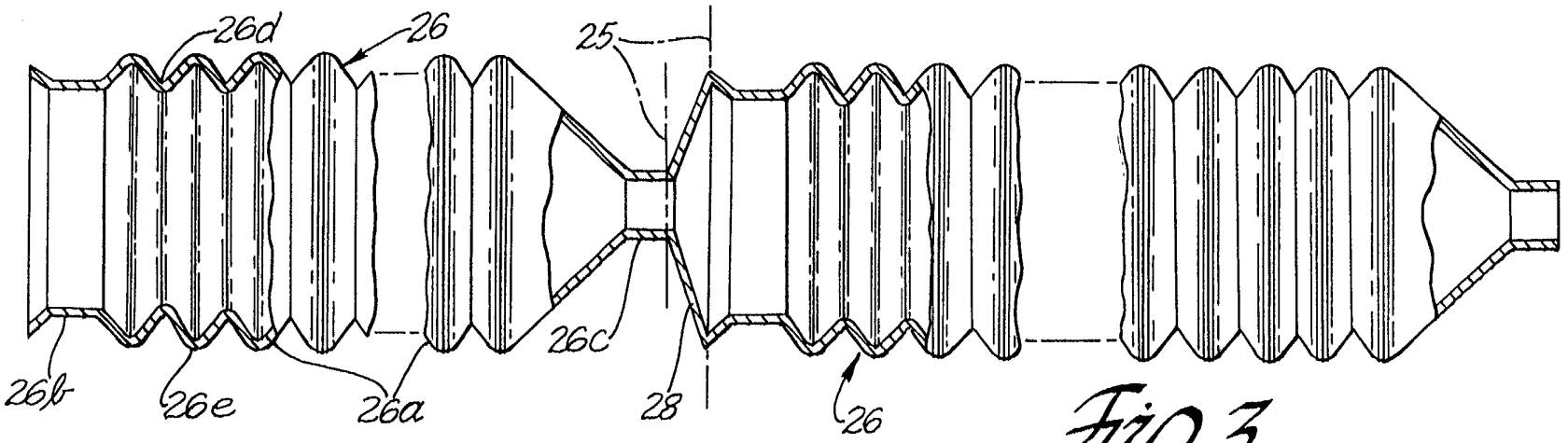

Fig. 3

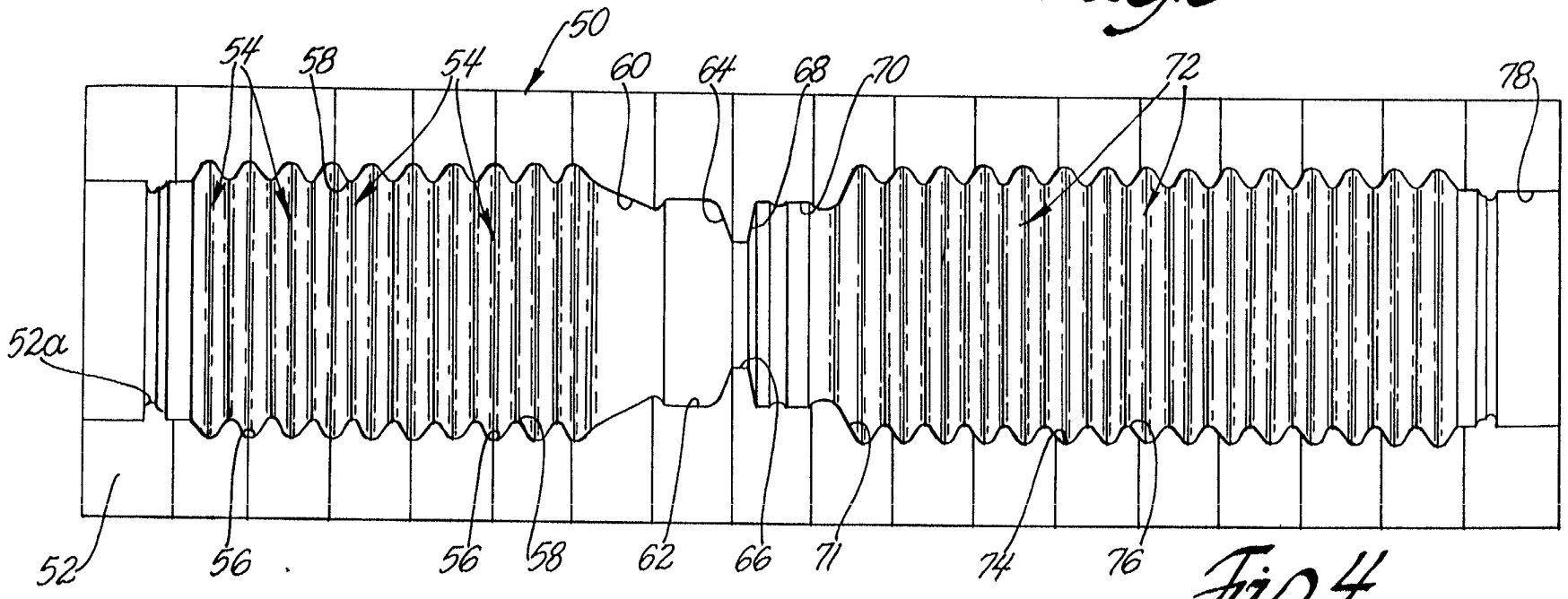

Fig. 4

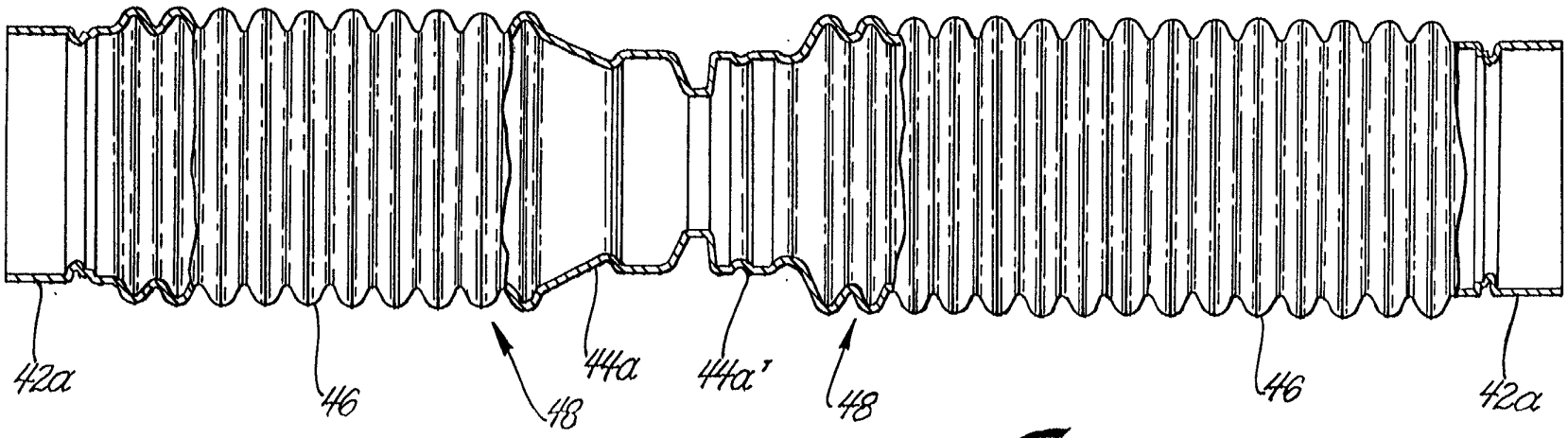

Fig. 5

PATENT

Attorney's Docket No. P-3009.2

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR CIP)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type: *(check one applicable item below)*

__X__ original
____ design
____ supplemental

NOTE: If the declaration is for an international Application being filed as a divisional, continuation or continuation-in-part application do not check next item; check appropriate one of last three items.

____ national stage of PCT

NOTE: If one of the follow 3 items apply then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR CIP.

____ divisional
____ continuation
____ continuation-in-part (CIP)

INVENTORSHIP IDENTIFICATION

WARNING: If the inventors are each not the inventors of all the claims an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

METHOD OF MAKING CORRUGATED PART

SPECIFICATION IDENTIFICATION

the specification of which: (complete (a), (b) or (c))
(a) __X__ is attached hereto.
(b) ___ was filed on as Serial No. or
___ Express Mail No., as Serial No. not yet known _____ and was amended on _____ (if applicable).

NOTE: Amendments filed after the original papers are deposited with the PTO which contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.

(c) ____ was described and claimed in PCT International Application No. _____ filed on _____ and as amended under PCT Article 19 on _____ (if any).

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations. § 1.56(a).

___ In compliance with this duty there is attached an information disclosure statement 37 CFR 1.97.

PRIORITY CLAIM

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) __X__ no such applications have been filed.

(e) _____ such applications have been filed as follows

NOTE: Where item (c) is entered above and the International Application which designated the U.S. claimed priority check item (e), enter the details below and make the priority claim.

EARLIEST FOREIGN APPLICATION(S), IF ANY FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, **month**, year)	PRIORITY CLAIM UNDER 37 USC 119
		__	___ ES ____NO
			___ YES ____NO
			___ YES ___ NO
			___ YES ___ NO
			___ YES ___ NO

ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

_____

_____

_____

POWER OF ATTORNEY

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)

E.J. Biskup	18,987	W.H. Francis	25,335	J.P. Moran	20,941
R.C. Collins	27,430	A.M. Grove	39,697	S.L. Permut	28,388
P.J. Ethington	17,299	R.W. Hoffmann	33,711	W.J. Schramm	24,795
J.C. Evans	20,124	E.T. Jones	40,037	R.L. Stearns	36,937
R.L. Farris	25,112	J.F. Learman	17,069	J.D. Stevens	35,691
F.J. Fodale	20,824	J.K. McCulloch	17,452	C.R. White	20,494
W.H. Griffith	16,706	W.J. Waugaman	20,304	M.J. Schmidt	43,904

SEND CORRESPONDENCE TO

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John C. Evans
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DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application of any patent issued thereon.

SIGNATURE(S)

Full name of **sole or first inventor** Thomas M. D'Angelo

Inventor's signature 

Date March 17, 2000 Country of Citizenship United States

Residence 315 North Evergreen

Plymouth, Michigan 48170

Full name of **second joint inventor,** _____

Inventor's signature _____

Date _____ Country of Citizenship _____

Residence _____

_____

CHECK PROPER BOX(ES) FOR ANY OF THE FOLLOWING ADDED PAGE(S) WHICH FORM A PART OF THIS DECLARATION

____ Signature for third and subsequent joint inventors. Number of pages added ____

____ Signature by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. Number of pages added ____

____ Signature for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. Number of pages added ____

* * *

_____ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (CIP) application. _____ Number of pages added _____

* * *

____ Authorization of attorney(s) to accept and follow instructions from representative.

* * *

If no further pages form a part of this Declaration then end this Declaration with this page and check the following item

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